



# BirdRad:

## A Mobile Avian Radar For Near-Range Sampling Of Bird Populations

24 August 2004 Savannah, GA

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# Overview

- Background to BirdRad Project
- Status of BirdRad Avian Radar
- Planned Enhancements
  - Current
  - Future



# Background

## ■ History

- Weather Radars (WRS-88 or NEXRAD) Used to Study Migratory Birds
  - Coverage Gaps
- 1999: DOD Legacy Contract To Sid Gauthreaux at Clemson University

## ■ Design Requirements

- Primary User Community: Natural Resources Managers
  - Application to BASH Came Later
- Portability - Within & Between Sites
- 360° Azimuth
- Range 0-6 NMi
- Measure Horizontal & Vertical(!) Location of Birds
- Affordable



# Status

- First BirdRad Unit Delivered in 2001
- Units Currently Operational At:
  - MCAS Cherry Point
  - NAS Patuxent River
  - NAS Point Mugu
  - NAS Whidbey Island
  - USAFB Elmendorf
  - SSC San Diego (R&D)



# Current Configuration

## BirdRad System Configuration

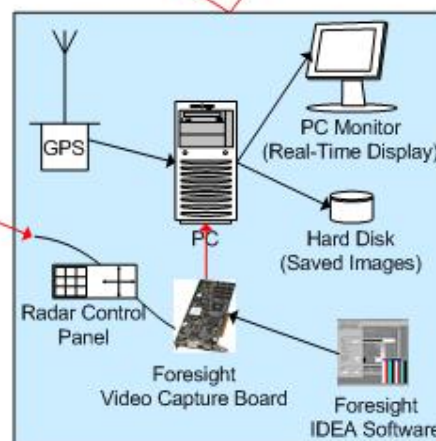
Furuno 2155BB Radar & Parabolic Antennal



BirdRad Trailer

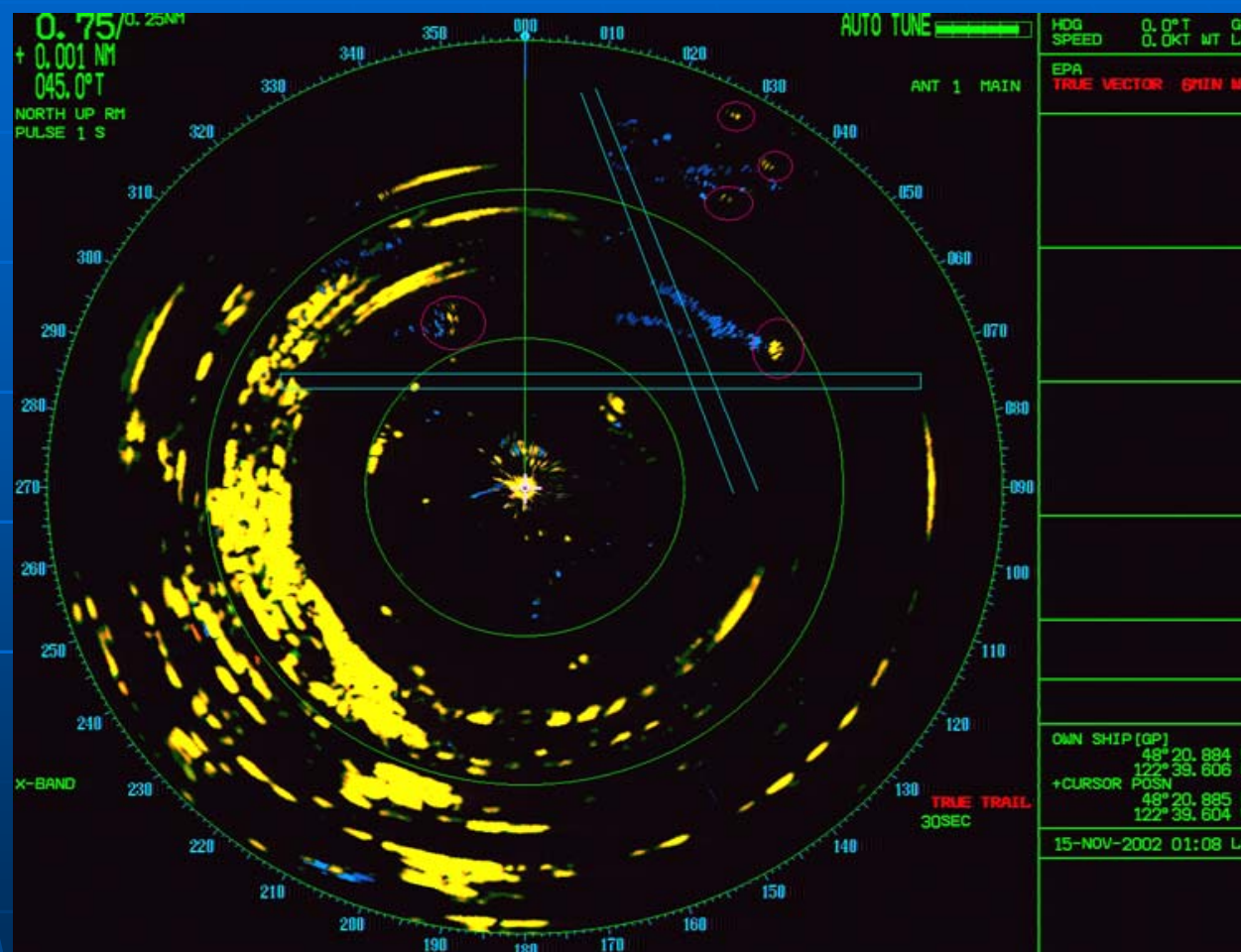


50 Ft. Umbilical Cord  
(Power, Control, Video Out)





# Visual Display

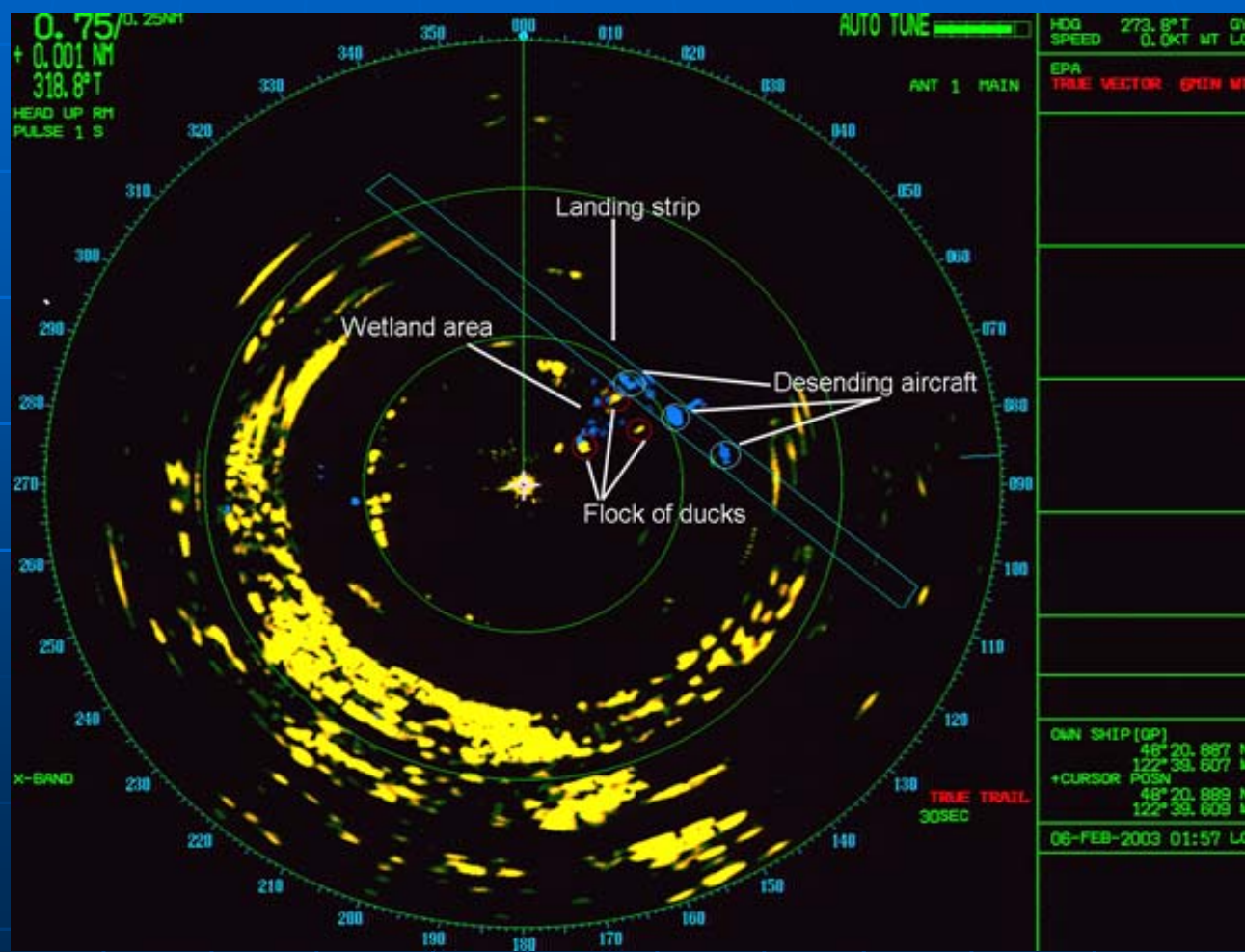


Sample BirdRad Display  
NAS Whidbey Island 12 Nov 2002 17:09 PST





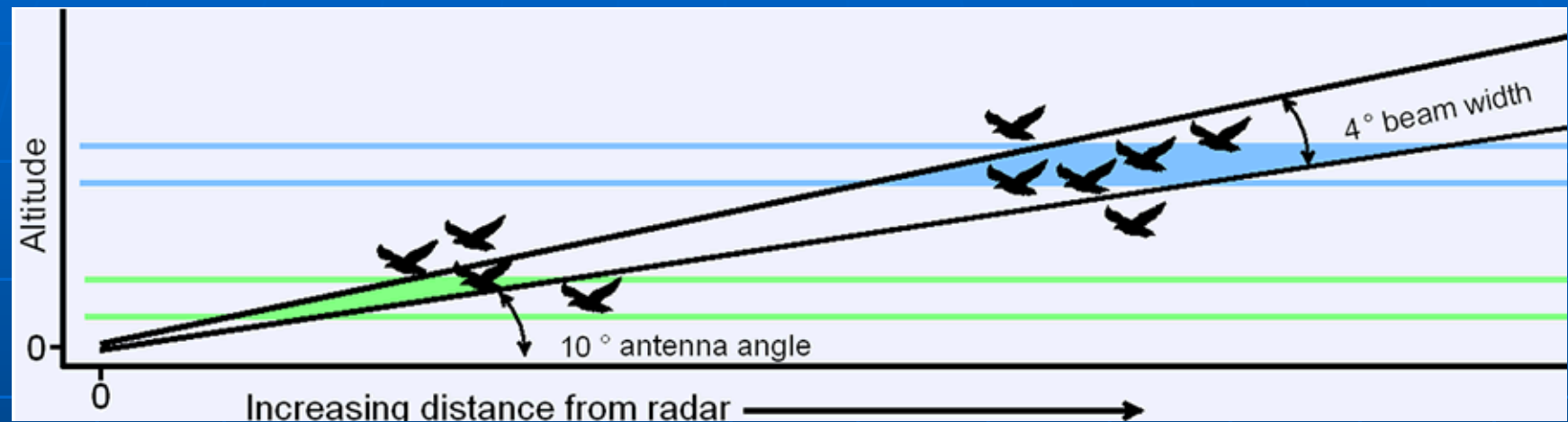
# Capturing A Near-Miss







# Narrow Radar Beam



- Radar Beam Width:  $4^{\circ}$ 
  - More Accurate Target Altitude
  - Larger "Cone of Silence" - Unsampld Volume Above & Below Beam
- Antenna Angle:  $5-10^{\circ}$



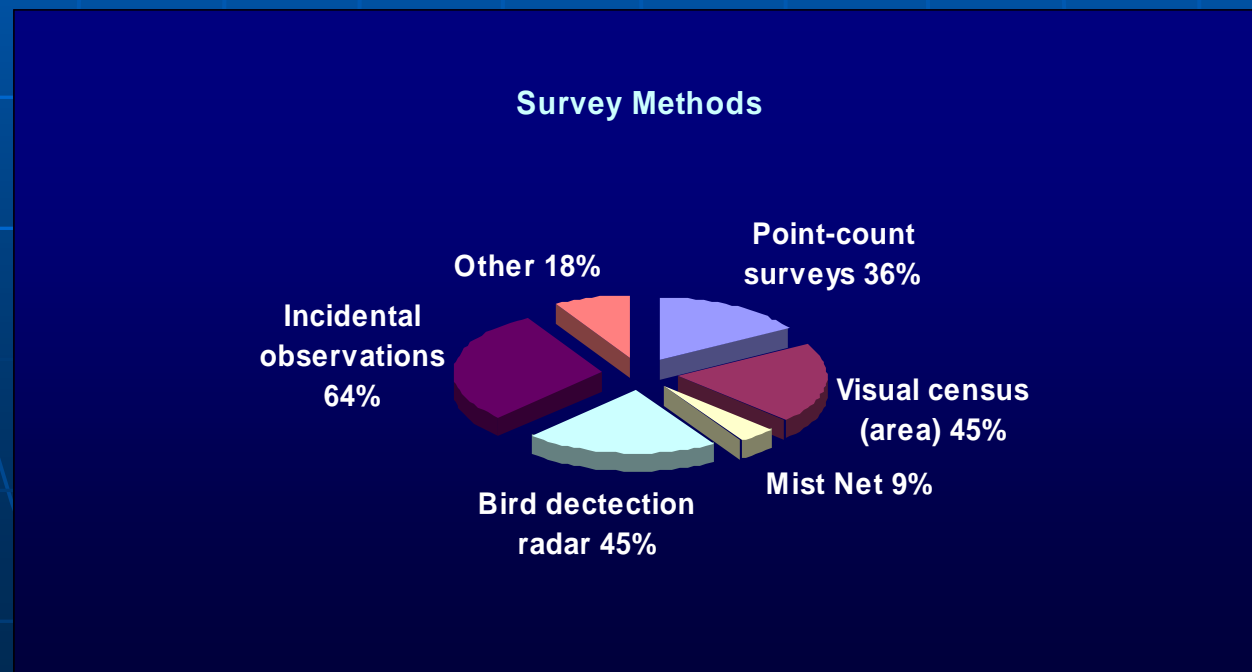
# Enhancements

- BirdRad System Met Design Goals
  - Highlighted Additional Requirements
- 2002: NAVFAC Tasks SSC San Diego to Research Additional Requirements of BirdRad Users
- SSC Extends Analysis of Requirements



# General Requirements

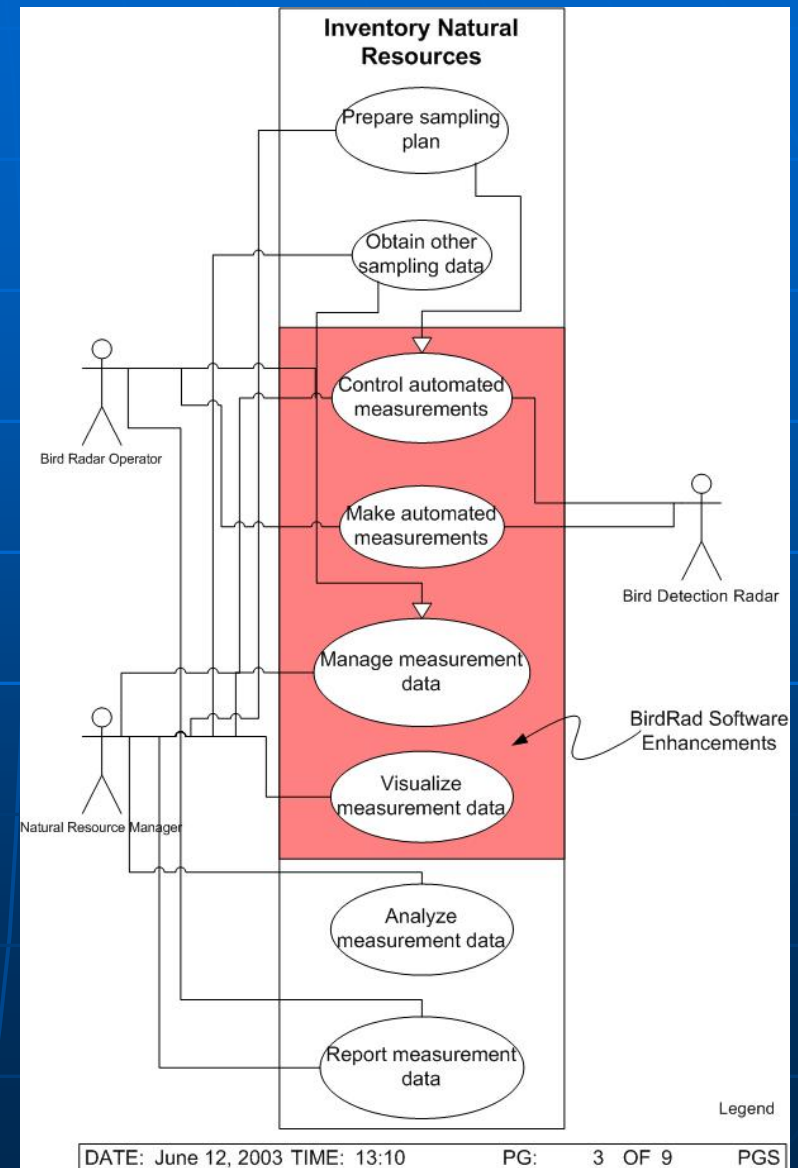
- Analyzed Resource Managers' Requirements for Bird Activity Data in General





# Use Case Analysis

- Uniform Modeling Language (UML)
- Aid Both Programmers & End-Users to Understand System Capabilities
  - “What’s In, What’s Out”





# Proposed Enhancements

Constraint	Enhancements
Digital Signal Processing	<ul style="list-style-type: none"><li>■ Clutter Removal</li><li>■ Data Acquisition System</li><li>■ Data Visualization</li></ul>
Furuno Controls	<ul style="list-style-type: none"><li>■ Remote Operations</li></ul>
Operations, Not R&D	<ul style="list-style-type: none"><li>■ Environmental Controls</li></ul>
Technical Feasibility & Cost	<ul style="list-style-type: none"><li>■ Birds vs. Insects</li><li>■ "Cone of Silence"</li></ul>



In Progress

Parallel



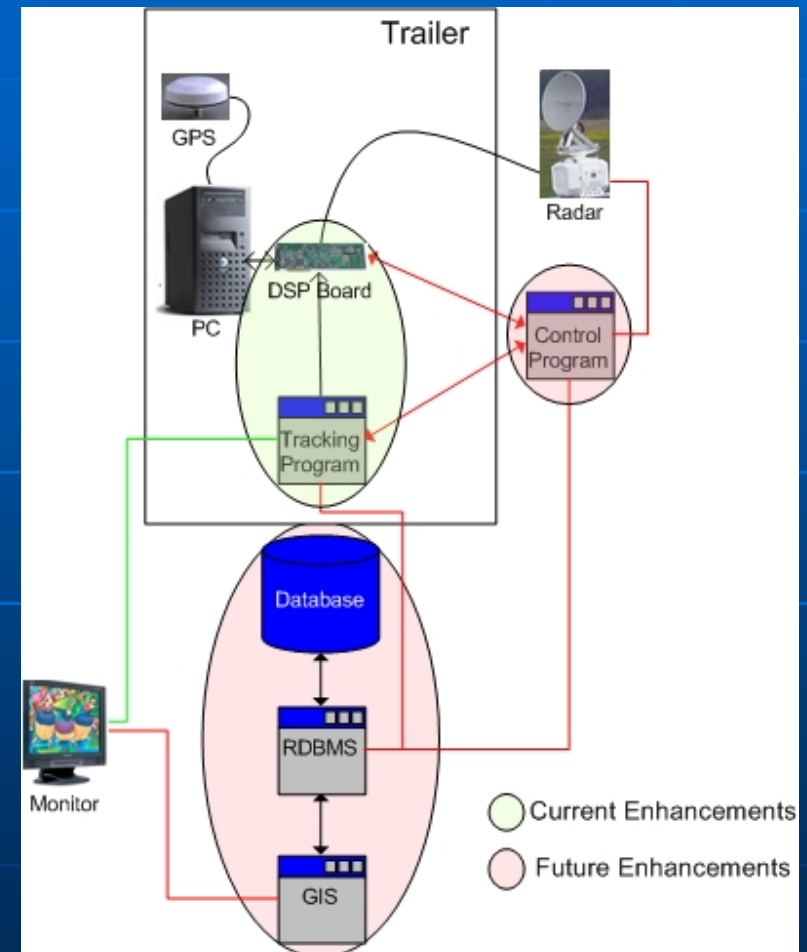
Planned

On Hold



# Proposed Enhancements

- Current Enhancements (Sicom Systems Ltd.)
  - Digital Signal Processing
    - Rutter Graphics Rsi4000RT
  - Target Tracking Program
    - MT-Tracker™
- Future Enhancements
  - Remote Scheduling and Control Program
  - Output to RDBMS With Feed to GIS







# Current Enhancements

- Target Trails Display (Optional - Emulates Furuno 2155BB)

- Yellow Heads & Blue Tails

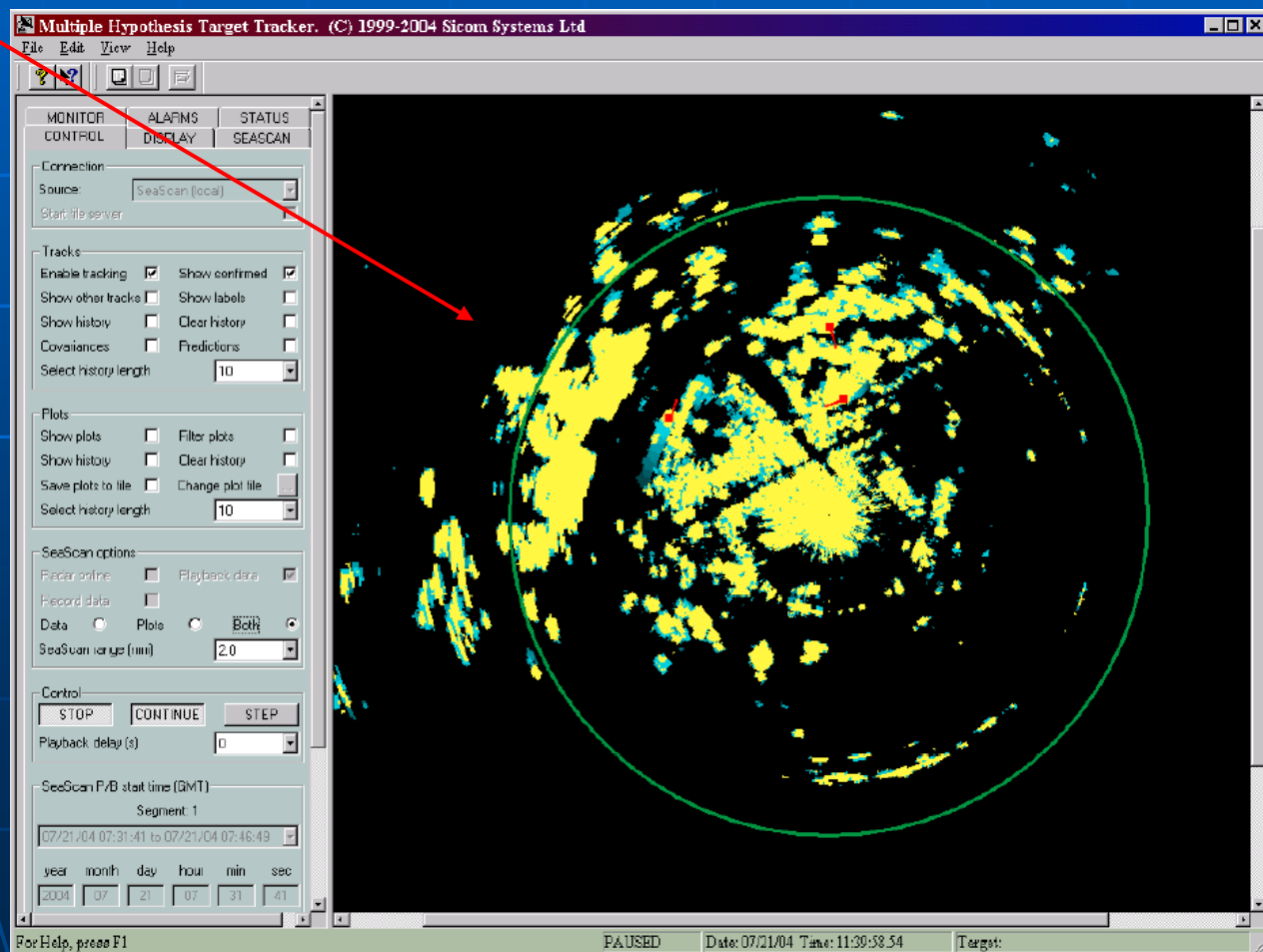
- User Can Select The Background:

- Target Trails (Standard)
- Target Trails (Clutter Removed)
- Map
- Blank

- User Can Select The Overlay:

- Targets
- Tracks
- Both

- Replay Video

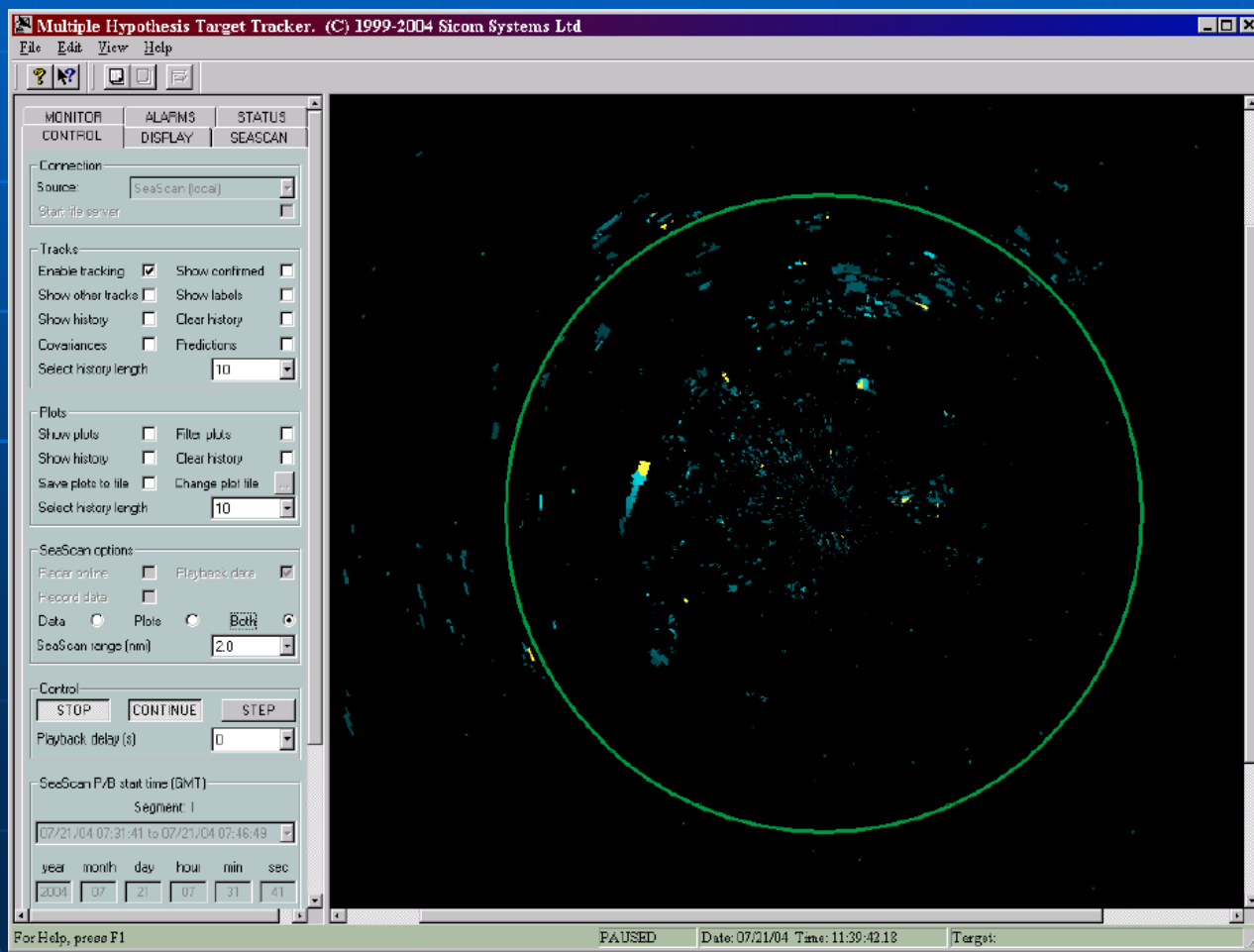




# Current Enhancements

NAS Patuxent River: 21 Jul 2004 11:39 EDT

- Apply Clutter Map
  - Residual Clutter
  - Heads & Tails

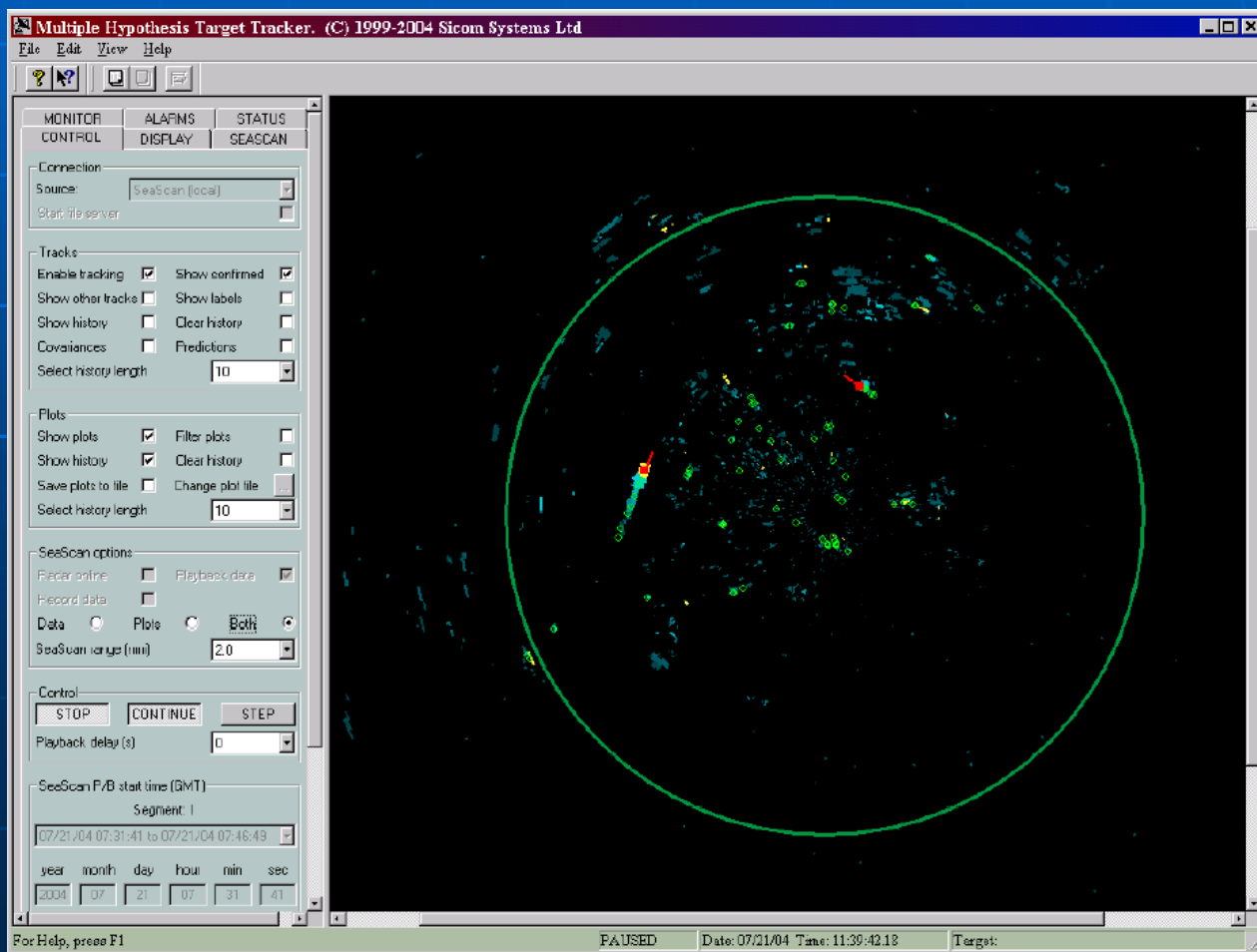




# Current Enhancements

NAS Patuxent River: 21 Jul 2004 11:39 EDT

- Display Targets (Circles) & Tracks (Squares)

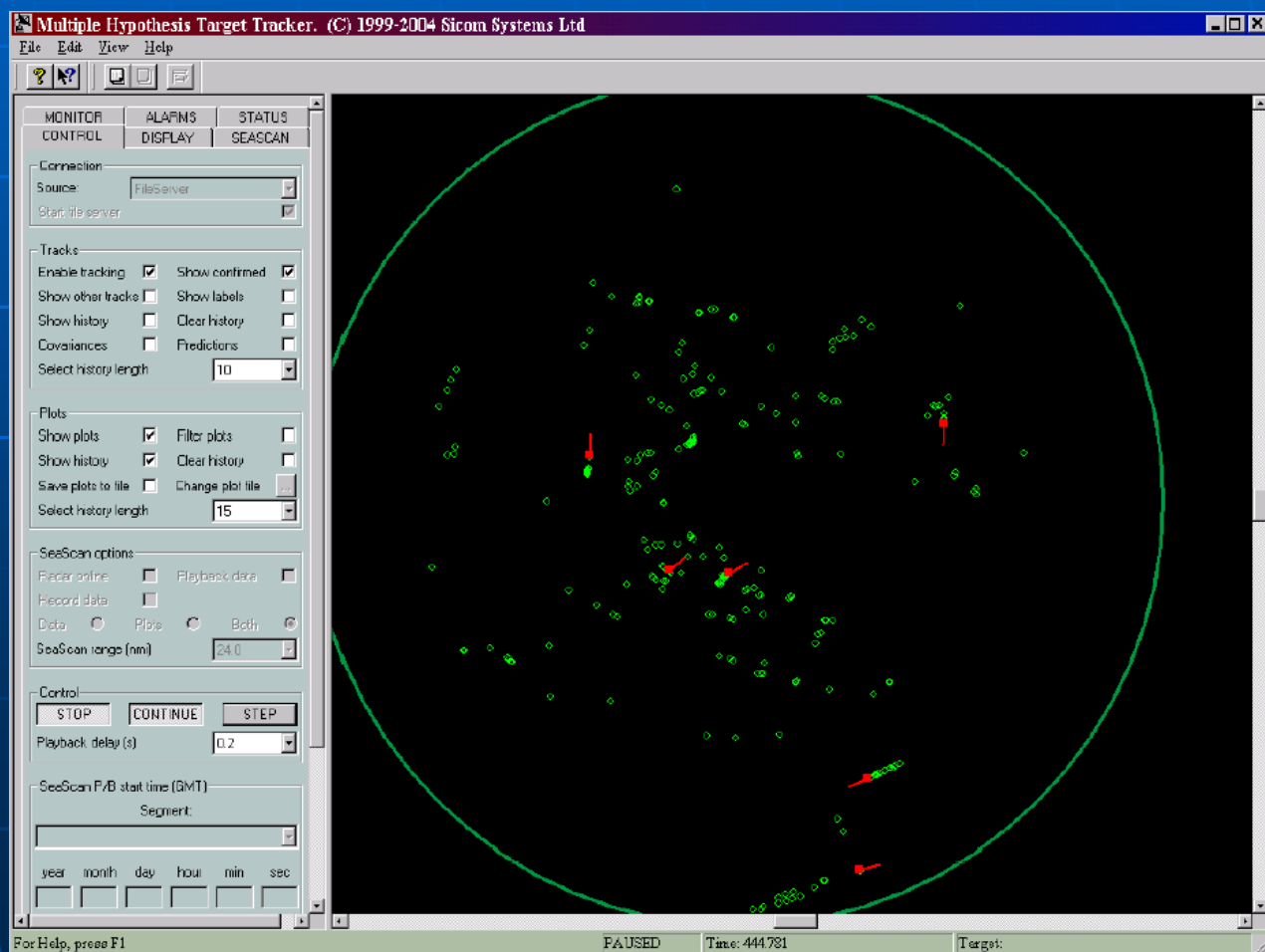




# Current Enhancements

NAS Patuxent River: 21 Jul 2004

- Image Showing  
Targets &  
Tracks Only



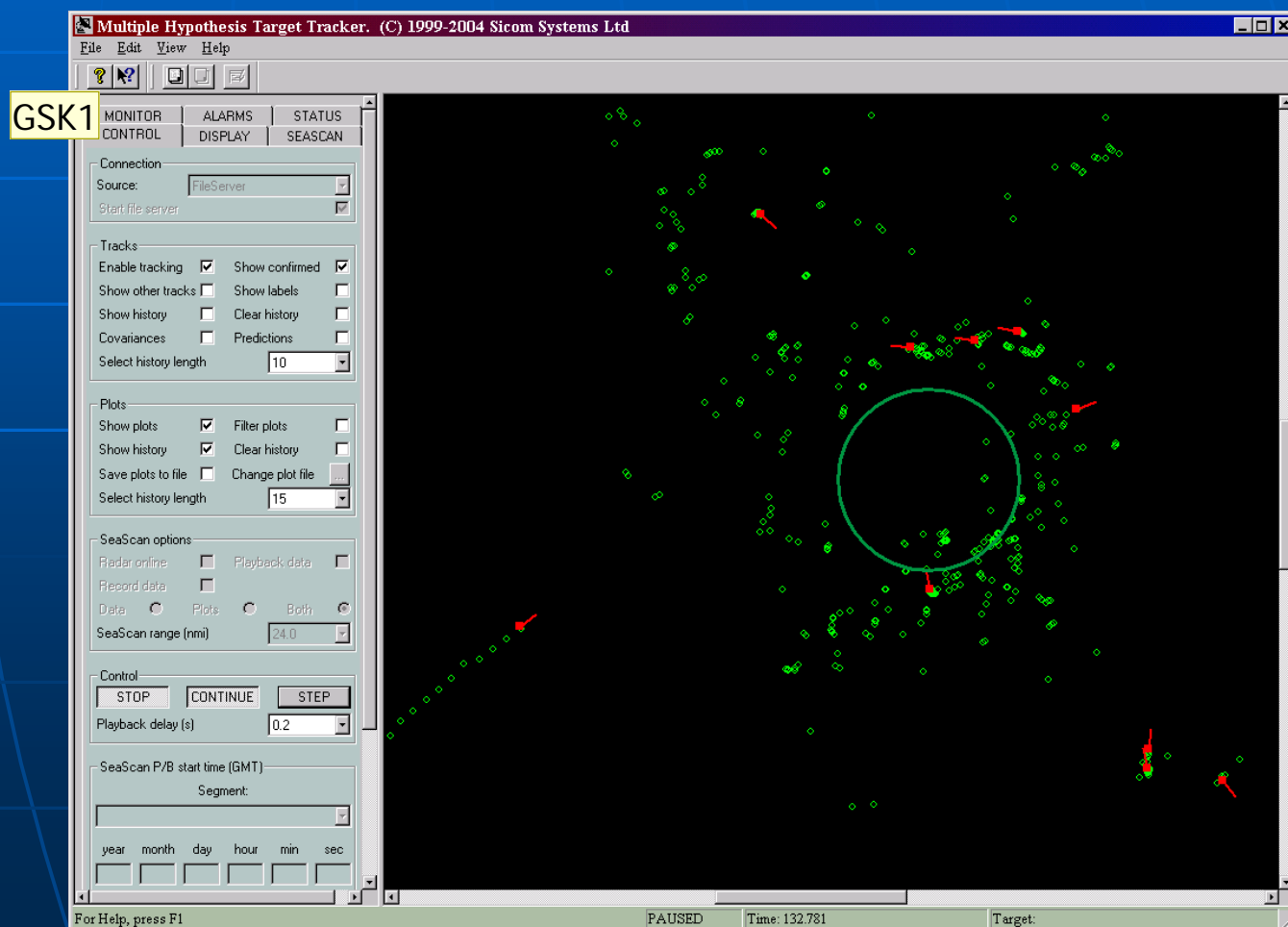


# Current Enhancements

NAS Patuxent River: 21 Jul 2004

## ■ Example Of Longer Range

- Note: Airplane at 8 o'clock, Ships at 5 o'clock



## Slide 18

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**GSK1**

Is this really 24 nmi?

Gerry Key, 8/17/2004

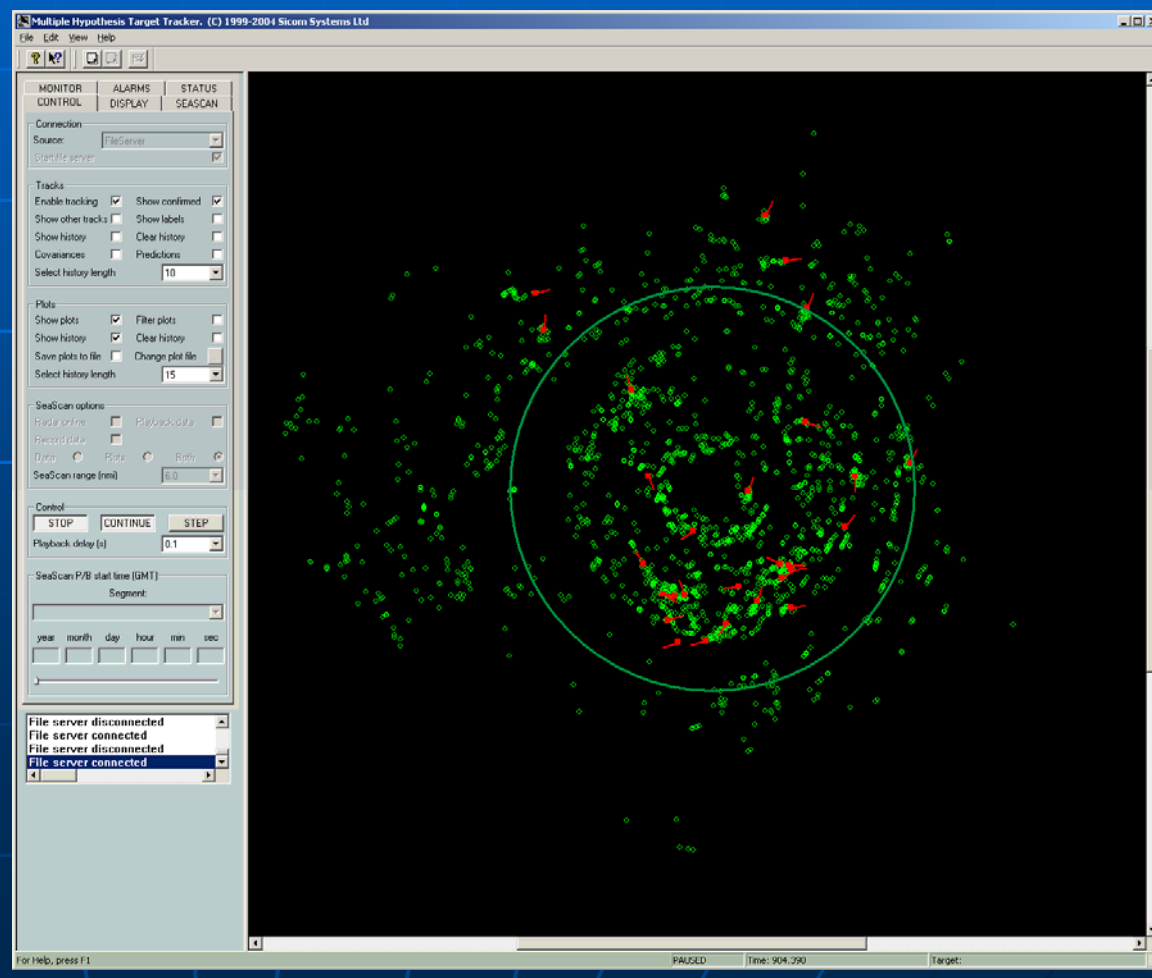




# Current Enhancements

NAS Patuxent River: 21 Jul 2004

- Crank Up Sensitivity
  - More Targets
    - Close to Residual Clutter/Noise Level
  - More False Alarms
    - Increases Processing Load on the Target-Tracking Program
    - MT-Tracker™ Has Handled This Load





# Trailer

- SSC Charleston → SSC San Diego
  - On Hold – Field Testing of HW/SW Enhancements





# Future Enhancements (FY05)

- Remote Control
  - Control Radar On/Off/Standby
  - Preprogram Sampling Times & Configuration
  - Alarms & Notification
- GIS & Database
  - Export XML
    - SensorML
  - Load Into Relational Database
    - Generalized Data Model With Other Measurement Data
    - Configuration As Well As Measurement Data
  - Visualize Using Standalone and Web-Based GIS
- Comparison Study with MARS – October 2004



# Future Plans

- Web Services
- Data Streaming
  - Digitized Raw Radar Data on the Net
  - Security Issues
- Other Sensors
  - Thermal Imaging (Insects)
  - Wind Speed Profilers (Insects)
- Taxonomic Identification
- Air Traffic Control? – No Plans



# Questions?

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